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Eugenics*

THE WORD "EUGENICS" was coined by Sir Francis Galton in 1890 as "the study of forces under social control which enhance or impair the inborn qualities of future generations".

That inborn qualities could be greatly modified by artificial selection was appreciated by ancient civilizations, which developed breeds of livestock by the application of rule-of-thumb methods of selective mating.

History

The idea that human beings differ in their hereditary endowment is also very old. Without attempting a review that would be mainly of antiquarian interest, a few references to Greek writings may not be out of place. In the sixth century B.C., Theognis took a pessimistic view of then current human mating practices:

With kine and horses, Kurnus, we proceed
By reasonable rules, and choose a breed
For profit and increase, at any price,
Of a sound stock without defect or vice.
But in the daily matches that we make
The price is everything; for money's sake,
Men marry; women are in marriage given.
The churl or ruffian, that in wealth has thriven,
May match his offspring with the proudest race.
Thus everything is mixed, noble and base.
If, then, in outward manner, form and mind,
You find us a degraded, motley kind,
Wonder no more, my friend; the cause is plain,
And to lament the consequence is vain.

Among the Spartans, mate selection was practised, and the age at which marriage took place was regulated to assure procreation at the time of life when it was believed the production of fine progeny was most likely. Exposure of weak or defective infants to the elements was practised by the Greeks and by many other peoples throughout history. In *The Republic*, Plato set forth a comprehensive code of eugenics that has become almost a horrible example of what an abstract philosophical approach can lead to.

Although different mating systems—endogamic or exogamic—have affected the genetic constitutions of human populations throughout history, their eugenic effects have been mainly accidental or incidental. The exact knowledge of the genetic process on which a rational eugenic policy might be based has existed for less than half a century. Until the key had been found to the riddle of heredity, man's penchant for theorizing had little practical value, and these ancient writings have now only an historical interest. Not until the latter half of the nineteenth century did factual bases for manipulating the "inborn qualities of future generations" begin to be developed. The publication of Darwin's *Origin of Species* in 1859 marked a turning point in biological science and provided the intellectual environment for experimental work on the phenomenon of evolution.

Darwin envisioned evolution as an interaction among the variable factors inherent in all organisms exposed to the rigours of survival. Those organisms better adapted to a particular environment tended to survive and to perpetuate their kind. The less well adapted variants failed to survive or to reproduce. This selective "sieve by veto" of the environment, operating over hundreds or thousands of generations, resulted in the emergence of strains of organisms showing remarkable adaptation to most varied environments. Darwin was puzzled by the nature of the variability of organisms that he saw as an essential factor in the evolution process. His speculations as to how and why variability

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occurred have proved in the light of much experimental hindsight to have been mainly erroneous.

The key that unlocked the mystery of variability and heredity was provided by Abbot Gregor Mendel in 1865. His experiments with peas, conducted in a monastery garden in what is now Czechoslovakia, formed the basis for the modern science of genetics. Mendel's pioneering was so revolutionary that thirty-five years elapsed before biological concepts had reached a point in development where his discoveries could be understood and evaluated. The science of genetics actually began with the rediscovery of Mendel's paper in 1900, rather than in 1865.

During this interval a cousin of Charles Darwin, Sir Francis Galton, had become convinced that heredity was a prime factor in determining the quality of human beings. Basing his studies on Darwin's evolution concept, Galton attacked the problem of heredity and environment—of nature *vs.* nurture—statistically. Between 1869 and 1883, he published three books supporting his view that nature—the inborn qualities of a human being—was a major component in the development of the gifted individual. In *Hereditary Genius, English Men of Science: Their Nature and Nurture*, and *Inquiries into Human Faculty* Galton reported his statistical analyses of the background of gifted individuals. He also pioneered in pointing out the value of studying identical twins as a means of learning more about the nature–nurture problem.

Galton's work broke new ground in analysing factors that contribute to the development of human intelligence and personality. His studies convinced him that heredity played an essential part in the development of individuals of unusual competence, and this became the motivation of his later years, leading to his founding of the eugenics movement. Towards the end of his life he wrote (1908):

> I take eugenics very seriously, feeling that its principles ought to become one of the dominant motives in a civilized nation, much as if they were one of its religious tenets. . . . Individuals appear to me as partial detachments from the infinite ocean of Being, and this world as a stage on which evolution takes place, principally hitherto by means of natural selection, which achieves the good of the whole with scant regard to that of the individual.
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> Man is gifted with pity and other kindly feelings; he has also the power of preventing many kinds of suffering. I conceive it to fall well within his province to replace Natural Selection by other processes that are more merciful and not less effective.

Galton devoted the later years of his life to promoting an acceptance of his view on eugenics and, through his influence, the Eugenics Education Society was founded in London in 1908. He bequeathed his fortune at his death to the University of London for the establishment of the Galton Laboratory.

Recent Advances

The past half-century has seen a very rapid advance in the science of genetics, adding to the effectiveness of animal-breeding techniques. The problem of nurture *vs.* nature has been experimentally studied, and in its original form it has been found to be meaningless in the sense that no blanket answer can be given. It is an approach useful only in terms of specific heredity and specific environment. For example, blood groups and eye colour are very little affected by environment, whereas body weight and intelligence are considerably more labile.

That many important physical characteristics of human beings are largely determined by genetic differences can no longer be questioned. Pedigree studies of many characteristics, both normal and pathological, are to be found in the literature. These heredity-determined differences range from trivial characteristics such as a blaze of white hair or a minor variation in ear form to profound physical or mental defects: sickle-cell anaemia, sex-linked muscular dystrophy, colour blindness, specific forms of mental defect, and the like.

The question of the extent to which mental, emotional, and personality differences are due to heredity is still under exploration.

Frederick Osborn (1951) surveyed the psychological and genetic studies on the interaction of heredity and environment made over the previous twenty-five years, and concluded:

> 1. Variations in capacity for developing intelligence tend to follow family lines. Similarity of hereditary factors accounts for a substantial part

of the known similarity in intelligence between parents and children.

2. Individual differences in intelligence are in part due to individual differences in inherited capacity. When the environment of two unrelated individuals is similar, differences in heredity probably play a major part in making the individuals different. When their environments differ and their heredity is somewhat similar, the environment is probably the major cause of their differences.

3. There is no evidence on hereditary factors as a cause of differences in the average intelligence of racial or regional groups in this country. Known differences in their environment are probably sufficient to account for present differences in the average intelligence of racial and regional groups.

4. Hereditary factors appear to account for a part of the average differences in intelligence between the skilled groups and the unskilled occupational groups. . . .

In order to obtain a proportionate increase in the number of persons at the upper levels of intelligence, it would be necessary to raise the level of hereditary capacity for intelligence.

That evaluation holds to-day. Although our picture of the genetic mechanism has changed, Galton's appraisal of the importance of inborn qualities in the emergence of high intellectual endowment has ample support. Granting that the expression of inborn endowment of man can be considerably modified, the evidence indicates that the inborn component remains paramount: it sets the limits.

Now, whether these limits are achieved depends on the nature and effectiveness of environmental stimuli. "Wooden legs are not inherited, but wooden heads are", Dr. E. G. Conklin remarked many years ago. The observation still holds.

Even before Osborn, a group of distinguished geneticists subscribed to a statement that explicitly spelled out the tremendous improvement in the human breed that might be made in a very few generations if the enhancement of the inborn qualities of future generations of mankind were purely a genetic exercise:

> . . . The intrinsic genetic characteristics of any generation can be better than those of the preceding generation only as a result of some kind of *selection*, i.e. by those persons of the preceding generation who had a better genetic equipment having produced more offspring, on the whole, than the rest, either through conscious choice, or as an automatic result of the way in which they lived. Under modern civilized conditions such selection is far less likely to be automatic than under primitive conditions, hence some kind of conscious guidance of selection is called for. To make this possible, however, the population must first appreciate the force of the above principles, and the social value which a wisely guided selection would have.
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> . . . conscious selection requires, in addition, an agreed direction or directions for selection to take, and these directions cannot be social ones, that is, for the good of mankind at large, unless social motives predominate in society. This in turn implies its socialized organization. The most important objectives, from a social point of view, are the improvement of those genetic characteristics which make (a) for health, (b) for the complex called intelligence and (c) for those temperamental qualities which favour fellow-feeling and social behaviour rather than those (to-day most esteemed by many) which make for personal "success" as success is usually understood at present.
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> A more widespread understanding of biological principles will bring with it the realization that much more than the prevention of genetic deterioration is to be sought for and that the raising of the level of the average of the population nearly to that of the highest now existing in isolated individuals, in regard to physical well-being, intelligence and temperamental qualities, is an achievement that would—so far as purely genetic considerations are concerned—be physically possible within a comparatively small number of generations. Thus everyone might look upon "genius", combined of course with stability, as his birthright. And, as the course of evolution shows, this would represent no final stage at all, but only an earnest of still further progress in the future.

Mutations and the Human Gene Pool

The years that have elapsed since the "Geneticists' Manifesto" was written have seen remarkable developments in genetic theory. Some of these give a heightened urgency to the need for developing means to conserve the adaptive efficiency of the gene pool of the human species. In his presidential address before the Society for the Study of Human Genetics in 1950, Dr. H. J. Muller explored the proposition that the lack of selection against nonadaptive genes means an inevitable deterioration of the human species. The principle is illustrated by the loss of organs and even organ systems in parasitic species. It is now clear that this deterioration is not due to a Lamarckian response to the nonuse of the organs, but rather to the buildup of nonadaptive mutations in organs no longer having survival

value for the species, and thus no longer exposed to effective selection.

The reason for this is to be found in the nature of the mutation process, which has been intensively studied in many organisms during the past thirty years. It is now established that mutations occur spontaneously at all loci, the rate of occurrence varying with the locus. These mutations are conceived of as being biochemical changes in a highly complex system, which is integrated and timed to trigger developmental and/or metabolic sequences. Defects such as albinism or diabetes are due to the absence of gene-controlled enzymes essential to pigment synthesis or to carbohydrate metabolism.

The development of organic adaptation is thus seen to consist of a process of scanning and screening the mutative changes that are constantly appearing in any species, the vast majority of which are deleterious.

The scanning process consists of sexual reproduction, which includes meiosis (crossing-over) and the formation of gametes, showing all possible combinations of parental genes, and the random recombination of these gametes at fertilization. A wide array of genotypic combinations from heterozygous parents is displayed in the progeny, to be screened by the test of survival. Under natural conditions this consists mainly of the ability of the organism to live and to reproduce.

The Problem of the Future

Until very recently, it would appear that the scanning–screening process has applied to the human species in much the same manner as it has applied to all other organisms. But Dr. Muller estimates that in order to maintain the present level of morbid mutations in the human gene pool, some 20 per cent of the population would have to suffer selective elimination through death or nonreproduction. Since in the advanced industrial countries to-day less than 5 per cent of the population fails to reach the age of 25—the mid-period of reproductivity —it is apparent that a buildup in mutations is occurring. Muller concludes that to-day "nothing like the equilibrium quota is eliminated by death before the age of reproduction". Nor, it might be added, by nonreproduction.

The rate at which this deterioration in the human gene pool is occurring is not definitely established, for adequate statistics do not exist in any country to permit a direct estimate of the existing load of morbid mutations. Over a short period of time it is a matter of no great consequence, for the buildup will unquestionably be slow. In the long run, however, the effects may be profound.

Muller foresees that the elimination of adaptive selection will eventually result in the biological disintegration of the human species:

> Our descendants' natural biological organization would in fact have disintegrated and have been replaced by complete disorder. Their only connections with mankind would then be the historical one that we ourselves after all had been their ancestors and sponsors, and the fact that their once human material was still used for the purpose of converting it artificially into some semblance of man. However, it would in the end be far easier and more sensible to manufacture a complete man *de novo*, out of appropriately chosen raw materials, than to try to refashion into human form those pitiful relics which remain.

As matters stand to-day, it appears that the current patterns of survival and fertility are not calculated to enhance the inborn qualities of the human species, either physically or psychologically, but rather are increasing the proportion of morbid genes in the gene pool of the modern industrial nations. The almost universal existence of birth rates that favour the reproduction of the less intelligent offers no prospect for upgrading the inborn intelligence factors of future generations, and the need to substitute some form of humane and voluntary selection for the stern selective forces of the past is the crucial eugenic dilemma. To hope that entire gene systems can be made over through some form of microgenetic magic is about as realistic at the present time as proposing to solve the population problem by resorting to space travel.

Accomplishments and Hypothesis

How this eugenic miracle is to be brought about remains an enigma, and the eugenics movement has not made much progress in coming to grips with this problem. In the early years of the eugenics movement in England, it was naïvely

assumed that the "divinely ordained" social classes into which the English population had traditionally been divided provided a ready-made criterion of eugenic excellence. To enhance the inborn quality of future generations nothing more would be needed than to encourage the breeding of the aristocrats and to check the breeding of the plebeians. In the United States, in a society lacking hereditary classes, the early eugenists could turn to no such convenient criterion of inborn excellence. This difficulty was met by the equally questionable assumption that race provided the necessary criterion. The eugenic salvation of mankind was given into the hands of the Great Blond Nordic. This theme developed an interesting variation in the delimitation of "problem families" (the Jukes, the Kallikaks, and the Nams). It was hoped that their elimination through compulsory sterilization would pretty much solve the eugenic problem.

The adoption by Adolf Hitler of a programme of "race purification" based on superficial and perverted derivatives from the naïve concepts of the early eugenic enthusiasts understandably engendered opposition to any programme of eugenic reform. Yet the problem remains.

The Scandinavian countries, with relatively homogeneous and stable populations, have made considerable progress in locating in their populations some strains that have a high frequency of human hereditary disease. Programmes of voluntary sterilization with adequate legal safeguards have made some impact in reducing hereditary defect. But these are trivial in terms of the over-all problem of enhancing the inborn qualities of the human population.

Since its establishment in 1921, the American Eugenics Society has undergone some changes of outlook and policy. Over the past ten years it has evolved the policy that it is possible to build into the culture a pattern of living which, without conscious volition on the part of the individual, will automatically assure a eugenic distribution of births. In a "Programme of Positive Eugenics" published by the Society in 1953, it was stated:

> . . . there are strong grounds for believing that the same means could be used to improve both the social and genetic inheritance. There is no divergence between the qualities desirable in a good social inheritance and the inherent capacities of a good genetic inheritance. The home conditions which are best suited to child development depend among other things on affection, intelligence, patience, honesty, loyalty and respect for the individual. . . . It seems almost certain that a distribution of births which would improve the social inheritance along these lines could be developed in such a way that at the same time it would tend to improve the genetic inheritance.

This has evolved into a "Eugenic Hypothesis" that the criterion for eugenic excellence is the "healthy family". "Health now includes almost all aspects of human well-being" and these aspects are held to be related. "Health, like liberty, is indivisible." This "healthy-family" complex is assumed to be transmitted in families more or less as a unit. The postulate therefore is that, once reproduction has become a matter of voluntary choice, the healthier families will desire to have the larger number of children and the unhealthy families will automatically desire to have the smaller number of children.

All that is necessary, according to this view, to start on the road to a eugenic millennium is a social situation in which parenthood is voluntary. The enhancement of the inborn qualities of the human breed will follow almost automatically.

That eugenic progress can be assured without the need for the individual to make choices except those that are assumed to be virtually automatic by reason of being a member of a "healthy family" or an "unhealthy family" appears to err on the side of naïveté. Furthermore, the assumption that all members of "healthy families" carry an equally favourable genetic endowment is untenable in view of the extreme heterozygosity of the human species. Finally, and the most serious objection to the "Eugenic Hypothesis", the existence of a genetic complex that can be defined as a "healthy family" runs counter to all genetic experience. A basic tenet of genetics is that the units that transmit heredity are discrete and independently inherited. Nor can the phenomenon of linkage, which tends to transmit genes located on the same chromosome as a unit, be adduced to support this concept. And crossing-over means that in populations—as distinct from pedigrees

—the unfavourable alleles are as likely to be linked as are the favourable alleles of the "healthy family" genes.

Only when relatively pure genetic strains of human beings exist can the "healthy family" act as an adequate selective criterion. Such strains are not to be found to-day; and human mating patterns do not provide much basis for expecting them to appear. The effective selection envisaged by Dr. Muller and the signers of the "Geneticists' Manifesto" cannot be achieved by the application of the "Eugenic Hypothesis".

It is unfortunate that the publication of the "Eugenic Hypothesis" produced so little comment or discussion. The writer proposed an alternative hypothesis, hoping it might stimulate further exploration of what appears to be the central problem of eugenic motivation. This took the view that an effective eugenic programme must necessarily be based on the individual rather than the family as the unit of selection. Its effectiveness would therefore depend upon highly motivated individual decisions: the motivation would have to be strong enough to result in individual decisions *not to have progeny* where the genetic prognosis was unfavourable.

It was postulated that a basis exists for developing such a compelling motivation: the overwhelming desire felt by virtually all women to bear perfect children, without physical or mental defect. Obstetricians testify that this desire is so deep-seated and overwhelming that the first question a woman asks about her newborn child is not "Is it a boy or girl?" but "Is the baby *perfect*?".

During the years since Galton, very little progress has been made in developing, identifying, and utilizing those forces under social control that might be called on to produce a eugenic society. Until the effective "motivational pressure points" that will promote sound eugenic decisions are identified and applied to bring about a selective pattern of births, eugenics will remain a paper discipline.

The crux of the eugenic dilemma lies in how to manipulate these "forces under social control" in order to assure a selectively favourable pattern of births. That social and economic factors influence fertility cannot be questioned. For example, in the United States over two-thirds of the female population between the ages of twenty and twenty-four is married, as compared to less than a fifth in Ireland. If the one Irish woman in five who marries during the years of maximum fertility had a better-than-average inborn endowment, the genetic quality of the Irish people would be rapidly enhanced. If the reverse were true, eugenic deterioration could be very rapid. No evidence exists that provides an answer to which—if either—of these situations exists in Ireland.

In the United States, on the other hand, where a situation approaching pangamy exists, any possibility of rapid enhancement of inborn qualities seems much less likely. Pangamy may be democratic, but it can hardly be selective. When virtually every woman produces approximately her quota of children, effective birth selection does not exist.

Neither in England nor in the United States —or in any other country, for that matter—does there exist a climate of opinion extensive enough and strongly enough motivated to form the basis for an effective programme. The steps which are being taken to develop such a climate of opinion are pathetically inadequate to produce any measurable effect.

In a population enjoying a very high degree of genetic enlightenment, the urge towards perfection could be a compelling and effective eugenic motivation. This is not the case to-day, anywhere on earth. Were it possible to identify in the heterozygote a majority of the existing lethal and morbid genes, a major revolution in attitudes towards reproduction might be brought about. Much progress in identifying heterozygotes has been made in recent years; and such a possibility may be realized before very long.

However, until more is learned, the mandate to perfection—which appears to be deeply built into our species—could be strong enough, if properly directed, to motivate a voluntary withholding from reproduction on the part of those so unfortunate as to carry an unfavourable genetic heritage. Great numbers of women have foregone reproduction for far less compelling reasons.

Since eugenics deals with human conception, with birth and death, it is the centre of one of the most highly charged areas of emotional stress in human experience and action. Eugenic progress will continue to be an extraordinarily complex and difficult field of human endeavour, but it remains a challenge that cannot indefinitely be evaded.

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